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Eko N. Onggosanusi

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EXAMINER

WONG, LINDA

ART UNIT

PAPER NUMBER

2611

NOTIFICATION DATE

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ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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Office Action Summary	Application No. 10/026,278	Applicant(s) ONGGOSANUSI ET AL.	
	Examiner LINDA WONG	Art Unit 2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 February 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-69 and 71-74 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 50-52 is/are allowed.
- 6) ☒ Claim(s) 1,2,10,13,14,19,21-32,39,40,42-44,47-49,53-69 and 71-74 is/are rejected.
- 7) ☒ Claim(s) 3-9,11,12,15-18,20,33-38,41,45 and 46 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Response to Arguments

1. Applicant's arguments filed 2/26/2010 have been fully considered but they are not persuasive.
 - a. Regarding **claims 1,31,39**, the applicant contends Lin et al fails to disclose the following limitations:
 - A) transmitter comprising a plurality of transmit antennas for transmitting the signal”
 - B) “wherein interference occurs between the respective streams”
 - C) “multiplying the signals with a conjugate transpose of an estimate of the channel effect ...”
 - D) “and with a conjugate transpose of a linear basis transformation matrix”

The examiner respectfully disagrees.

Limitation A) Please see the rejection below.

Limitation B) Col. 1, line 41-45 discloses a number of undesirable interference sources can cause a GPS receiver to be ineffective or unreliable. Interference between streams is a common noise that affects received signals. Such interference would fall into the category of undesirable interference sources.

Limitation C: The examiner has indicated in the office action a power estimate is used to multiply with the signal. Although Lin et al uses a power estimate, Alexander, Jr et al discloses calculating power estimate using channel impulse response or channel estimates. Since Alexander, Jr. et al shows the process of calculating power estimates or monitoring power by using channel estimation, a conjugate transpose of the power estimate would include the channel estimate.

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Limitation D: Lin discloses a list of functions, Harr, Bessell, Legendre polynomials, etc, are selected for radical basis but the equation as mentioned in the rejection (Col. 7, equation 6) uses orthonormal vector to produce the matrices. (Col. 8, lines 55-62 and Col. 9, lines 14-30) The matrix produced using orthonormal vectors would be linear.

2. Regarding **claims 2,10,13,14,27,28,32,40**, such claims are dependent on respective independent claims. Regarding the limitations of such claims the applicant indicates is not recited by the references, the examiner has clearly discussed the reasons for rejection as stated in the office action. Please see the rebuttal of the independent claim and the rejection of such claims.
3. Regarding **claim 21**, such claim is dependent on claim 1. Please see the rejection and rebuttal of the limitations of claim 1 as well as the rejection of claim 21.
4. Regarding **claim 22**, such claim is dependent on claim 1. Please see the rejection and rebuttal of the limitations of claim 1 as well as the rejection of claim 22. The applicant has also remarked that the examiner depends on Heath Jr et al for rejection of claim 22. The examiner has indicated in the office action claim 14 of Heath Jr et al discloses such a limitation. An obvious statement for reason for rejection is also provided. Please see the reference, specifically claim 14 for the limitation.
5. Regarding **claims 23,24,25,30**, such claim is dependent on claim 1. Please see the rejection and rebuttal of the limitations of claim 1 as well as the rejection of claims 23,24,25,30. The applicant has also remarked that the examiner depends on Heath

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Jr et al for rejection of claims 23,24,25,30. The examiner has indicated in the office action the location within Heath Jr et al where such limitation is disclosed. Please see the office action and Heath Jr et al disclosure.

6. Regarding **claim 42**, the applicant contends Lin et al fails to disclose the following limitations:

- A) transmitter comprising a plurality of transmit antennas for transmitting the signal"
- B) "wherein interference occurs between the respective streams"
- C) "multiplying the signals with a conjugate transpose of an estimate of the channel effect ..."
- D) "and with a conjugate transpose of a linear basis transformation matrix"
- E) Linear basis matrix in response to "a communication received by the transmitter from the receiver via a feedback channel"

The examiner respectfully disagrees.

Limitation A) Please see the rejection below.

Limitation B) Col. 1, line 41-45 discloses a number of undesirable interference sources can cause a GPS receiver to be ineffective or unreliable. Interference between streams is a common noise that affects received signals. Such interference would fall into the category of undesirable interference sources.

Limitation C) The examiner has indicated in the office action a power estimate is used to multiply with the signal. Although Lin et al uses a power estimate, Alexander, Jr et al discloses calculating power estimate using channel impulse response or channel estimates. Since Alexander, Jr. et al shows the process of calculating power estimates or monitoring power by using channel estimation, a conjugate transpose of the power estimate would include the channel estimate.

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Limitation D) Lin discloses a list of functions, Harr, Bessell, Legendre polynomials, etc, are selected for radical basis but the equation as mentioned in the rejection (Col. 7, equation 6) uses orthonormal vector to produce the matrices. (Col. 8, lines 55-62 and Col. 9, lines 14-30) The matrix produced using orthonormal vectors would be linear.

Limitation E) The rejection for claim 42 has been adjusted due to the remarks and limitations. Please see the rejection.

7. Regarding **claim 29**, such a claim is dependent on claim 1. Please see the rebuttal of claim 1. Regarding the limitation “the plurality of transmit antennas are less in number than the plurality of receive antennas”, please see rejection.
8. Regarding **claims 43,44,47,48,54-56,57,58**, such claims are dependent on claim 42. Please see the rebuttal of claim 42 and rejection of the dependent and independent claim.
9. Regarding **claim 59**, such a claim is dependent on claim 42. Please see the rebuttal of claim 1. Regarding the limitation “the plurality of transmit antennas are less in number than the plurality of receive antennas”, please see rejection.
10. Regarding **claim 60**, the applicant contends the prior art fails to disclose
 - A) “receiving on a plurality of receive antennas a plurality of signals from a plurality of transmit antennas coupled to a transmitter”
 - B) “producing a channel estimate in response to a predetermined signal of the plurality of signals”
 - C) “multiplying the plurality of signals by the channel estimate and the matrix”

The examiner respectfully disagrees.

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Limitation A) Fig. 3, label 61, 74 shows an array of antennas used for reception. Fig. 2, label 42 and 44 an array of antennas. Col. 4, lines 25-26 discloses an array antenna.

Limitation B) and C) The examiner has indicated in the office action a power estimate is used to multiply with the signal. Although Lin et al uses a power estimate, Alexander, Jr et al discloses calculating power estimate using channel impulse response or channel estimates. Since Alexander, Jr. et al shows the process of calculating power estimates or monitoring power by using channel estimation, a conjugate transpose of the power estimate would include the channel estimate.

11. Regarding **claims 61-67**, such claims are dependent on claim 60. Please see the rebuttal and rejection of the independent claim as well as the rejection of the dependent claims.
12. Regarding **claim 68-69,71-74**, the applicant contends the prior art fails to disclose
 - a. "modulating the plurality of signals"
 - b. "transmitting the multiplied modulated signals from the plurality of transmit antennas"
 - c. "selecting a matrix from a finite set of matrices in response to a signal from a remote transmitter"
 - d. "transmitting the plurality of signals from a plurality of transmit antennas, including transmitting a predetermined signal to a remote receiver on a channel different from a channel of the plurality of signals"

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Please see the rejection for further explanation.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. **Claims 1,2,10,13-14,27-28,31,32,39,40** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US Patent No.: 6392596) in view of Alexander, Jr. et al (US Patent No.: 6259924), further in view of Velazquez et al (US Patent No.: 6593880).

a. **Claim 1,**

i. Lin et al discloses

- “a plurality of receive antennas for receiving the signals as influenced by a channel effect between the receiver and transmitter” (Fig. 3, label 61, wherein condition of the channel would affect the quality of the signal. Fig. 2, label 42 shows an array of antenna elements. Col. 4, lines 15-16 discloses an array of antenna elements. Fig. 2 and 3 shows the receiver is wireless, wherein the signal received would be from a remote transmitter)
- “circuitry for multiplying the signals with a conjugate transpose of” a power estimate "with a conjugate transpose of a linear basis

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transformation matrix" (Col. 7, equation 6 determines the conjugate transpose of the power estimates, c , and basis vectors, e , wherein the distribution law of conjugate transpose would indicate the conjugate transpose would be performed on both the power estimates and basis vectors.)

- "circuitry for selecting the linear basis transformation matrix from a finite set of linear basis transformation matrices" (Col. 8, lines 56-62 and Col. 9, lines 14-30 discloses selecting the orthonormal basis.)
 - "circuitry for removing the interference between the respective streams" (Col. 1, lines 41-52 discloses interference sources cause the receiver to be unreliable. Synchronization of phase (change all phases) is needed to remove the misalignment or interference caused by these sources. (Col. 3, lines 6-14))
- ii. Lin et al fails to disclose "channel estimation". Alexander, Jr. et al disclose power monitoring can be performed using channel impulse responses or effect of the channel. (Col. 8, lines 26-42) It would have been obvious to one skilled in the art at the time of the invention to power monitor based on the channel estimation as disclosed by Alexander, Jr. et al into Lin et al's conjugate transpose calculation so to provide an accurate determination of adjustment of power, thus cost effectively allocating power.
- iii. Lin et al fails to show the receiver receives information from "a plurality of transmit antennas for transmitting the signals which comprise respective

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streams of independent symbols". Velazquez et al discloses a transmitter with a plurality of antennas. (Fig. 13, label 35) Col. 10, lines 31-45 discloses baseband signals are transmitted onto 3 channels or 3 antennas, wherein each of the baseband signals are composed of symbols. It would have been obvious to one skilled in the art at the time of the invention to transmit using a plurality of antennas as disclosed by Velazquez et al to the receiver of Lin et al so to increase the transmit data amount by sending data onto different channels.

- iv. Lin et al discloses reducing interference within the received signal (Col. 1, lines 41-46), but does not indicate the type of interference the received signal will encounter is co-channel interference or noise between respective streams. Velazquez et al discloses a system for reducing co-channel interference within a GPS spatially diverse system. (Abstract) It would have been obvious to one skilled in the art at the time of the invention to recognize received signals within a GPS system will experience co-channel interference as disclosed by Velazquez et al and reduce the interference as disclosed by Lin et al so to effectively eliminate noise within the received signal so one can determine the message within the received signal.

b. **Claims 2,32,40,**

- i. Alexander, Jr. et al disclose "circuitry for determining the estimate of the channel effect" (Fig. 6, label 612).

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- ii. Lin et al discloses "circuitry for selecting selects the linear basis transformation matrix in response to the estimate of the" power. (Col. 7, lines 45-50 discloses the optimal weight corresponds to the weight vector is selected based on the power.)
- iii. Alexander, Jr. et al discloses power can be determine based on the channel estimate (Col. 8, lines 26-42), thus it would have been obvious to one skilled in the art at the time of the invention to incorporate selecting the basis matrix as disclosed by Lin et al based on the power produced using channel estimation as disclosed by Alexander, Jr. et al so to provide accurate adjustment of the signals so to eliminate interference effectively.
- c. **Claims 13 and 14**, Lin et al discloses "the linear basis transformation matrix is operable for performing a rotation and phase change of the symbols" and "each matrix in the finite set of linear basis transformation matrices is operable for performing a rotation and phase change by the transmitter of the symbols." (Col. 9, e) shows the weights are phase shifted, wherein phase shifting will also perform rotation.)
- d. **Claim 27**, Velazquez et al disclose the plurality of transmit antennas and the plurality of receive antennas are a same number of antennas. (Fig. 12 shows the receive antennas, Fig. 13 shows the transmit antennas, wherein the number of antennas on both sides are the same.)
- e. **Claim 28**, Velazquez et al discloses the same number of antennas equals two. (Fig. 14 and 15 show 10 receive and transmit antennas, respectively, Fig. 12

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and 13 show 3 receive and transmit antennas, respectively. This indicates there can be any number of transmit or receive antennas, wherein the number can be 2.)

f. **Claim 29**, Velazquez et al discloses "wherein the plurality of transmit antennas are less in number than the plurality of receive antennas." (Fig. 14 and 15 show 10 receive and transmit antennas, respectively, Fig. 12 and 13 show 3 receive and transmit antennas, respectively. Fig. 17 shows there are N number of receivers. This indicates there can be any number of transmit or receive antennas, wherein the number of transmit antennas can be less than the receiver antennas.)

g. **Claim 31** recites all the limitations of claim 1, but claim 1 does not recite the following limitations:

i. Lin et al discloses

- "wherein interference occurs between the respective streams" (Fig. 3, labels 70, 68 show transmitters sending information to the receiver, label 61.) Although Lin et al does not disclose co-channel interference, Velazquez et al discloses a system for reducing co-channel interference within a GPS spatially diverse system. (Abstract) It would have been obvious to one skilled in the art at the time of the invention to recognize received signals within a GPS system will experience co-channel interference as disclosed by Velazquez et al and reduce the interference as disclosed by Lin et al so to effectively eliminate noise

within the received signal so one can determine the message within the received signal.

- “a receiver for receiving signals from the transmitter” (Fig. 3, label 61.

Fig. 3 shows the receiver is wireless wherein the received signals would be from a remote transmitter.)

- ii. Lin et al fails to disclose “a transmitter comprising a plurality of transmit antennas for transmitting signals which comprise respective streams of independent symbols and wherein interference occurs between the respective streams”. Velazquez et al discloses such a transmitter. (Fig. 15, label 214, Abstract discloses co-channel interference within a gps system.) It would have been obvious to one skilled in the art to transmit using a plurality of antennas as disclosed by Velazquez et al in a transmitter transmitting to the receiver of Lin et al so to effectively transmit a signal.

- h. **Claim 39** recites all the limitations of claim 1, but claim 1 does not recite the following limitations:

- i. Lin et al discloses

- “receiving signals a plurality of receive antennas and transmitted from a transmitter” (Fig. 3, label 61. Fig. 3, labels 70, 68 show transmitters sending information to the receiver, label 61.)

- ii. Lin et al fails to disclose “a transmitter comprising a plurality of transmit antennas for transmitting signals which comprise respective streams of independent symbols and wherein interference occurs between the

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respective streams". Velazquez et al discloses such a transmitter. (Fig. 15, label 214, Abstract discloses co-channel interference within a gps system.)

It would have been obvious to one skilled in the art to transmit using a plurality of antennas as disclosed by Velazquez et al in a transmitter transmitting to the receiver of Lin et al so to effectively transmit a signal.

- iii. Lin et al discloses the received signal is influenced by the power estimate (Fig. 3, label 66), but fails to disclose the power estimate is based on the channel estimate. Alexander, Jr. et al disclose power monitoring can be performed using channel impulse responses or effect of the channel. (Col. 8, lines 26-42) It would have been obvious to one skilled in the art at the time of the invention to power monitor based on the channel estimation as disclosed by Alexander, Jr. et al into Lin et al's conjugate transpose calculation so to provide an accurate determination of adjustment of power, thus cost effectively allocating power.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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14. **Claims 21** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al in view of Alexander, Jr. et al, further in view of Hafeez et al (US Patent No.: 6920191).

a. **Claim 21**,

- i. Lin et al in view of Alexander, Jr. et al fails to disclose “circuitry for determining the estimate of the channel effect in response to pilot symbols received from the transmitter”.
- ii. Hafeez et al discloses such a limitation. (Fig. 2, label 213 training symbols and label 218 channel estimator) It would have been obvious to one skilled in the art at the time of the invention to incorporate calculating channel estimation with known training symbols so to accurately determine channel estimation.

15. **Claims 19,22-26,30,53** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al in view of Alexander, Jr. et al, further in view of Heath, Jr. et al (US Patent No.: 6298092).

a. **Claims 19,26,53**, Lin et al and Alexander, Jr. et al fail to disclose “the circuitry for multiplying comprises space time block coded decoding circuitry”.

- i. Heath, Jr. et al discloses such a limitation. (Col. 3, lines 60-65 discloses space time block code, wherein a receiver will have the same decoder in order to decipher the message sent.) It would have been obvious to one skilled in the art at the time of the invention to incorporate space time block

decoding as disclosed by Heath, Jr. et al into Lin et al in view of Alexander, Jr. et al so to efficiently decipher information transmitted and provide robustness to Lin et al's invention.

b. **Claim 22,**

- i. Lin et al in view of Alexander, Jr. et al fails to disclose "the circuitry for removing the interference between the respective streams is selected from a group consisting of circuitry for zero forcing, circuitry for determining a minimum mean square error, and circuitry for determining a maximum likelihood."
- ii. Heath, Jr. et al discloses such a limitation .(Claim 14) It would have been obvious to one skilled in the art to select from such a group for interference elimination as disclosed by Heath, Jr. et al in to Lin et al in view of Alexander, Jr. et al so to effectively and robustly eliminate interference.

c. **Claim 23,** Heath, Jr et al discloses "the signals comprise CDMA signals and further comprising circuitry for despread the CDMA signals." (Fig. 4, label decoder, wherein a decoder can perform despread. Col. 4, lines 30-35 discloses CDMA signals.)

d. **Claim 24,** Heath, Jr. et al discloses TDMA signals. (Col. 4, lines 30-35 discloses TDMA signals.)

e. **Claim 25,** Heath, Jr. et al discloses "the symbols are selected from a group consisting of quadrature phase shift keying symbols, binary phase shift keying

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symbols and quadrature amplitude modulation symbols." (Col. 3, lines 49-51 discloses selecting among such modulations.)

f. **Claim 30,**

i. Heath, Jr. et al discloses

- "a deinterleaver coupled to receive an output" (Fig. 4, label 102)
- "a decoder coupled to receive an output of the deinterleaver" (Fig. 4, label 102 acts as deinterleaver and decoder.)

ii. Heath, Jr. et al fails to disclose "a demodulator coupled to the receive signals", but Heath, Jr et al discloses a receive processing unit and a modulator (Fig. 4, label 87 shows a receiving processing unit. Fig. 3, label modulation), wherein given a modulator, the receiving unit will have an equal and comparable demodulator. Thus, it would have been obvious to one skilled in the art at the time of the invention to incorporate demodulator in the receiving processing unit as disclosed by Heath, Jr. et al so to effectively decode the information transmitted.

iii. Heath, Jr. et al fails to disclose a multiplying circuitry. Lin et al discloses such a limitation (Fig. 3, label 62) and a user interface (Fig. 3, label 94), where decoding of information from the received signal would be performed.

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16. **Claims 42-44,47-48,57-58** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US Patent No.: 6392596) in view of Velazquez et al (US Patent No.: 6593880), further in view of Steer (US Patent No.: 6845246).

a. **Claim 42,**

i. Lin et al discloses

- “circuitry for selecting a linear basis transformation matrix from one of at least two matrices” (Col. 8, equation 9 shows the linear basis transformation matrix, Col. 5, lines 9-11 discloses the optimal weight is determined based on power monitoring, which is determined based on the communication between the transmitter and receiver.)
- “circuitry for multiplying the data symbols with the linear basis transformation matrix, wherein the signals are responsive to the multiplication with the linear basis transformation matrix” (Fig. 3, label 62 for multiplying the weights with the received data.)

ii. Lin et al fails to show the receiver receives information from “a plurality of transmit antennas for transmitting the signals which comprise respective streams of independent symbols”. Velazquez et al discloses a transmitter with a plurality of antennas. (Fig. 13, label 35) Col. 10, lines 31-45 discloses baseband signals are transmitted onto 3 channels or 3 antennas, wherein each of the baseband signals are composed of symbols. It would have been obvious to one skilled in the art at the time of the invention to transmit using a plurality of antennas as disclosed by Velazquez et al to the receiver

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of Lin et al so to increase the transmit data amount by sending data onto different channels.

- iii. Lin et al discloses calculating the matrices based on the power estimate (Fig. 3, label 99, 104), but fails to disclose the matrices are determined "in response to a communication received by the transmitter from the receiver via a feedback channel". Steer discloses determining power adjustment according to a feedback control between the transmitter and receiver. (Fig. 2, label 25, 23,24 and Col. 2, line 15-36) It would have been obvious to one skilled in the art at the time of the invention to incorporate feedback information as disclosed by Steer to determine power disclosed by Lin et al so to set an optimal level of transmission power.

b. **Claim 43,**

- i. Lin et al discloses
 - "circuitry for selecting the linear basis transformation matrix" (Col. 7, equation 5, Col. 8, equation 9, lines 55-62 and Col. 9, b) discloses selecting the linear basis transformation matrix.)
- ii. Steer discloses "circuitry for providing the communication to the transmitter via the feedback channel" (Fig. 2, label 25, 23,24 and Col. 2, line 15-36)

- c. **Claim 44,** Lin et al discloses "circuitry for selecting the linear basis transformation matrix selects from a finite set of linear basis transformation matrices" (Col. 8, equation 9, Col. 9, lines 1-10 and b).)

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- d. **Claims 47,48**, Lin et al discloses "the linear basis transformation matrix is operable for performing a rotation and phase change of the symbols" (Col. 9, e) shows the weights are phase shifted, wherein phase shifting will also perform rotation.)
 - e. **Claims 57,58,59**, Velazquez et al discloses "the receiver comprises a plurality of receive antennas", "the plurality of transmit antennas and the plurality of receive antennas are a same number of antennas" and "wherein the plurality of transmit antennas are less in number than the plurality of receive antennas". (Fig. 14 and 15 show 10 receive and transmit antennas, respectively, Fig. 12 and 13 show 3 receive and transmit antennas, respectively. Fig. 17 shows there are N number of receivers. This indicates there can be any number of transmit or receive antennas, wherein the number of transmit antennas can be the same as the receiver antennas or different number of transmit antennas compared to receive antennas.)
17. **Claims 54-56** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US Patent No.: 6392596) in view of Velazquez et al (US Patent No.: 6593880), further in view of Steer (US Patent No.: 6845246), further in view of Heath, Jr. et al (US Patent No.: 6298092).
- a. **Claim 54**, Heath, Jr et al discloses "the signals comprise CDMA signals and further comprising circuitry for despreading the CDMA signals." (Fig. 4, label decoder, wherein a decoder can perform despreading. Col. 4, lines 30-35 discloses CDMA signals.) It would have been obvious to one skilled in the art to

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receive CDMA signals as disclosed by Heath, Jr et al by the receiver of Lin et al based on design choice and preference of the type of system.

- b. **Claim 55**, Heath, Jr. et al discloses TDMA signals. (Col. 4, lines 30-35 discloses TDMA signals.)
- c. **Claim 56**, Heath, Jr. et al discloses "the symbols are selected from a group consisting of quadrature phase shift keying symbols, binary phase shift keying symbols and quadrature amplitude modulation symbols." (Col. 3, lines 49-51 discloses selecting among such modulations.)

18. **Claims 60-67** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US Patent No.: 6392596) in view of Alexander, Jr. et al (US Patent No.: 6259924), further in view of Hafeez et al (US Patent No.: 6920191) and further in view of Heath, Jr. et al (US Patent No.: 6298092).

- a. **Claim 60**,
 - i. Lin et al discloses
 - "receiving a plurality of signals on a plurality of receive antennas" (Fig. 3, label 61)
 - "selecting a matrix from a finite set of matrices in response to one of the" power "and an interference cancellation technique" (Col. 7, lines 45-50 discloses the optimal weight corresponds to the weight vector is selected based on the power.)

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- “multiplying the plurality of signals by the” power “and the matrix” (Fig. 3, label 62 for multiplying the signals with the output from the weight generator, label 66. Col. 7, equation 6 shows the signals are multiplied by the weight matrices.)
- ii. Lin et al fails to disclose “channel estimate” is used for selection and multiplication.
- iii. Alexander, Jr. et al discloses power can be determine based on the channel estimate (Col. 8, lines 26-42), thus it would have been obvious to one skilled in the art at the time of the invention to incorporate selecting the basis matrix as disclosed by Lin et al based on the power produced by channel estimation as disclosed by Alexander, Jr. et al so to provide accurate adjustment of the signals so to eliminate interference effectively.
- iv. Lin et al fails to disclose “producing a channel estimate in response to a predetermined signal of the plurality of signals”.
- v. Hafeez et al discloses such a limitation. (Fig. 2, label 213 training symbols and label 218 channel estimator) It would have been obvious to one skilled in the art at the time of the invention to incorporate calculating channel estimation with known training symbols so to accurately determine channel estimation.
- vi. Lin et al fails to disclose receiving “from a plurality of transmit antennas coupled to a transmitter.” Heath, Jr et al discloses such a limitation. (Fig. 2, label 18a-m) It would have been obvious to one skilled in the art at the time

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of the invention to transmit using a plurality of antennas as disclosed by Heath, Jr. et al to the receiver of Lin et al so to increase data transmission amount by transmitting on multiple channels.

- b. **Claim 61**, Heath, Jr et al discloses despreading the plurality of signals in response to a code.” (Fig. 4, label decoder, wherein a decoder can perform despreading, wherein despreading would be performed with a code.)
- c. **Claim 62**, Lin et al discloses “removing interference from the plurality of signals.” (Col. 1, lines 41-52 discloses interference sources cause the receiver to be unreliable. Synchronization of phase (change all phases) is needed to remove the misalignment or interference caused by these sources. (Col. 3, lines 6-14))
- d. **Claim 63**,
 - i. Lin et al discloses
 - “identifying the selected matrix to a remote receiver” (Col. 9, b),c),d),e))
 - “calculating a product of the” power “and the selected matrix prior to step of multiplying” (equation 6 shows the multiplication of the basis matrix with the power matrix. Based on the distribution law of multiplication, the product of the power and basis matrix can be calculated prior to multiplication with X or the received signal as shown in equation 6.)
 - ii. Lin et al fails to disclose “channel estimate”.

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- iii. Alexander, Jr. et al discloses power can be determine based on the channel estimate (Col. 8, lines 26-42), thus it would have been obvious to one skilled in the art at the time of the invention to incorporate selecting the basis matrix as disclosed by Lin et al based on the power produced by channel estimation as disclosed by Alexander, Jr. et al so to provide accurate adjustment of the signals so to eliminate interference effectively.

e. **Claim 64,**

- i. Heath, Jr. et al disclose
- “converting a group of the plurality of signals to serial signals” (Fig. 4, label 98 converts the plurality of signals to a serial signal.)
 - “demodulating the serial signals” (Fig. 4, label decoding, wherein decoding can also perform the functionalities of demodulation.)
 - “deinterleaving the serial signals” (Fig. 4, label 102)
 - “decoding the serial signals” (Fig. 4, label 102)
- ii. it would have been obvious to one skilled in the art at the time of the invention

- f. **Claim 65,** Hafeez et al discloses “the predetermined signal comprises at least one pilot symbol”. (Fig. 2, label 213 training symbols and label 218 channel estimator)

- g. **Claim 66,** Lin et al discloses “the matrix is a linear basis transformation matrix.” (Col. 9, lines 1-14 shows examples of the basis matrix.)

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- h. **Claim 67**, Lin et al discloses "the step of receiving the plurality of signals from a plurality of remote transmitter, wherein the plurality of signals are encoded differently for each respective antenna of the plurality of transmit antennas." (Fig. 3, labels 70,68,72 shows the plurality of signals, wherein each mobile station transmits different signals and each one would be encoded differently.) Lin et al fails to disclose the transmitter contains a plurality of antennas. Heath, Jr et al discloses such a limitation. (Fig. 2, label 18a-m)

19. **Claims 68-69,71** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US Patent No.: 6392596) in view of Heath, Jr. et al (US Patent No.: 6298092), further in view of Agee et al (US Publication No: 20040095907).

a. **Claim 68**,

- i. Lin et al discloses
- "receiving a plurality of signals" (Fig. 3, label 61, Col. 4, lines 25-26 disclose an array antenna, wherein the array antenna will receive a plurality of signals.)
 - "selecting a matrix from one of at least 2 matrices in response to a signal from a remote transmitter" (Col. 8, lines 56-62 discloses selecting the orthonormal basis. Fig. 3 shows the internal components of the receiver, wherein the figure shows the receiver receives wirelessly. The transmitter would be remote since the receiver is wireless.)

- “multiplying the signals by the matrix” (Col. 7, equation 6 multiplies the received signals with the matrix.)
 - “transmitting the multiplied signals” (Fig. 3 shows the receiver process the received signal and transmits it for further processing.)
- ii. Lin et al fails to disclose “modulating the plurality of signals”. Lin et al shows a receiver (Fig. 2,3) but fails to disclose a transmitter. Heath, Jr. et al discloses such a limitation. (Fig. 3, label modulation within a transmitter) It would have been obvious to one skilled in the art at the time of the invention to incorporate modulation as disclosed by Heath, Jr. et al in to Lin et al's invention so to prepare the signal for transmission.
- iii. Lin et al fails to disclose transmitting through a plurality of antennas the adjusted received signals. Agee et al discloses a transceiver for transmitting the processed received signals. (Fig. 24 shows the transceiver for transmitting transmit weighted signal using plurality of antennas, wherein the transmit signals are determined using the weights provided by the receiver.). It would have been obvious to one skilled in the art at the time of the invention to transmit the signals as disclosed by Agee et al, wherein such processed received signals are processed as disclosed by Lin et al so to use the information from the receiver to improve the transmitter.
- b. **Claim 69**, Heath, Jr. et al discloses “the step of spreading the plurality of signals in response to a code.” (Fig. 3, label modulation, wherein spreading is a

type of modulation performed with a code and can be performed in the disclosed modulator depending on the choice of the inventor.)

c. **Claim 71,**

i. Heath, Jr. et al discloses

- “encoding the plurality of signals” (Fig. 3, label pre-coder)
- “interleaving the plurality of signals” (Fig. 3, label interleaver)
- “converting the plurality of signals to serial signals” (Fig. 4, label 98 combines the plurality of signals to produce one serial signal.)

d. **Claim 72,**

i. Lin et al discloses

- “receiving a plurality of signals” (Fig. 3, label 61, Col. 4, lines 25-26 disclose an array antenna, wherein the array antenna will receive a plurality of signals.)
- “selecting a matrix from one of at least 2 matrices in response to a signal from a remote transmitter” (Col. 8, lines 56-62 discloses selecting the orthonormal basis. Fig. 3 shows the internal components of the receiver, wherein the figure shows the receiver receives wirelessly. The transmitter would be remote since the receiver is wireless.)
- “multiplying the signals by the matrix” (Col. 7, equation 6 multiplies the received signals with the matrix.)

ii. Lin et al fails to disclose “transmitting the multiplied signals from a plurality of transmit antennas” and “transmitting a predetermined signal to a remote

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receive on a channel different from a channel of the plurality of signals".

Agee et al discloses transmitting a feedback from the receiver to the transmitter (paragraph 83). Fig. 24 shows the transceiver for transmitting transmit weighted signal using plurality of antennas, wherein the transmit signals are determined using the weights provided by the receiver. It would have been obvious to one skilled in the art at the time of the invention to feedback information and transmit the signals as disclosed by Agee et al, wherein such processed received signals are processed as disclosed by Lin et al so to use the information from the receiver to improve the transmitter.

- iii. Lin et al fails to disclose "modulating the plurality of signals". Lin et al shows a receiver (Fig. 2,3) but fails to disclose a transmitter. Heath, Jr. et al discloses such a limitation. (Fig. 3, label modulation within a transmitter) It would have been obvious to one skilled in the art at the time of the invention to incorporate modulation as disclosed by Heath, Jr. et al in to Lin et al's invention so to prepare the signal for transmission.

- e. **Claim 73**, Lin et al discloses "the matrix is a linear basis transformation matrix." (Col. 9, lines 1-14 shows examples of the basis matrix.)
- f. **Claim 74**, Heath, Jr. et al discloses "the step of receiving the plurality of signals from a plurality of remote transmit antennas, wherein the plurality of signals are encoded differently for each respective antenna of the plurality of transmit antennas." (Lin et al discloses receiving a plurality of signals. (Fig. 3 shows the receiver) Heath, Jr et al discloses a plurality of transmit antennas (Fig. 2, label

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18a-m), wherein each signal transmitted are encoded differently (Fig. 6, label 28 performs one type of encoding and labels 204 and 206 performs another encoding.)

Allowable Subject Matter

20. **Claims 50,51-52** are allowed over prior art.
21. **Claims 3-9,10-12,15-18,20,33-38,41,45-46,49** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LINDA WONG whose telephone number is (571)272-6044. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on (571) 272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Linda Wong/
Examiner, Art Unit 2611

/David C. Payne/
Supervisory Patent Examiner, Art Unit 2611